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# Developing Environmental Competence in Primary School Students Through Project-Based Learning in the Integrated Course ‘I Explore the World’

## Summary

The article focuses on the development and implementation of project-based learning as an effective means of developing environmental competence among primary school students. It presents cases of successful projects implemented in schools and identifies their impact on learning outcomes that meet the regulatory requirements of the State Standard of Primary Education of Ukraine. The research problem addresses the formation of environmental competence in primary school students through project-based learning in the lessons of the integrated course “I Explore the World”. The study employed a mixed-methods approach, incorporating theoretical methods (analysis of scientific literature and regulatory documents) and empirical methods (pedagogical observation, analysis of student work, and testing of educational materials). The results showed an increase in students’ understanding of the relationships between human activity and the state of nature, as well as heightened interest and activity in observing environmentally appropriate behavior in everyday life, which confirms the effectiveness of the project-based activities covered in the lessons.

**Keywords:** environmental competence, primary school students, project-based learning, integrated course “I Explore the World”

## 1. Introduction

Environmental competence, as both a societal and educational issue, is becoming increasingly critical

in the context of today’s challenges, as evidenced by the attention it receives from international institutions. For instance, at the United Nations Conference on Environment and Development (UNCED), it was emphasized that the issues of population, environment, and development are so closely interconnected that none should be considered in isolation anymore. Educational programs must reflect this interdependence and facilitate a comprehensive understanding and response to these challenges on a global scale (United Nations Conference on Environment & Development, 1992).

In the UNESCO-UNEP Environment Education Newsletter, the need for new environmental attitudes, skills, knowledge, understanding, and behavior has been articulated, especially among primary school students, high schoolers, and university students. This need is linked to the necessity of developing knowledge and awareness that enable youth to actively solve environmental problems and overcome the challenges we face today. It is considered that citizenship education is the best way to help people cope with these issues (UNESCO, 1994, p. 1–2).

Within the framework of the #LearnForOurPlanet study, educational curricula and programs of 46 UNESCO member countries were analyzed. 92% of them

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contained at least one reference to environmental topics, however, the depth of inclusion was generally rated as very low. The study highlights that insufficient attention is given to social-emotional skills and competencies oriented towards action, which are crucial for activities related to the environment. It also emphasizes the need to implement education for sustainable development with a focus on cognitive skills, social and emotional learning, collaboration skills, problem-solving, and resilience development (UNESCO, 2021, p. 9).

The relevance of the issue for Ukraine is confirmed by the study of the Environmental Performance Index, which indicates an unsatisfactory state of environmental well-being even before the full-scale invasion by the aggressor in February 2022. In the global ranking by the Environmental Performance Index (EPI), Ukraine holds the 52nd position out of 180 countries (The Environmental Performance Index, 2022).

This led to the adoption by the Cabinet of Ministers of Ukraine (2021) of the “Strategy for Environmental Security and Adaptation to Climate Change through 2030”. The primary environmental threats identified for Ukraine include significant levels of atmospheric, water, and soil pollution, an imperfect system of state supervision (control) and monitoring of the natural environment. There is also a critical situation with the formation, accumulation, storage, processing, utilization, and disposal of waste.

The goal of an ecological education is to help students master basic rules and skills for behavior in nature considering organisms and their environments; to recognize major changes in their surroundings based on observations of nature; to understand the main characteristics of different types of environments; to know and choose specific options aimed at protecting and improving their environment; to actively participate in enhancing the environment of the school and its vicinity; and to use natural resources economically, reducing consumption that burdens the environment (Piscová et al., 2023, p. 651).

Ecological education is the most effective way to identify and address environmental problems in society (Sukma et al., 2020, p. 2). Ecological education enhances ecological literacy, which is essential for an individual to become confident and competent in solving environmental issues; it not only increases

specific knowledge about environmental matters but also transforms conservation attitudes into human behavior (Uddin et al., 2020, p. 2).

Environmental competence is defined as the ability to apply ecological knowledge and skills that promote the development of ecological thinking, awareness, and worldview. Environmental competence also includes promoting a healthy lifestyle, abstaining from harmful habits, focusing on the rational use of natural resources, and adhering to environmental safety standards in daily life (Mirzaeva, 2019, p. 73).

Over the last few decades, project-based learning has received significant attention in the field of education. Research findings by scholars Lu Zhang and Yan Ma have shown that project-based learning can enhance students’ learning motivation, problem-solving skills, teamwork, and communication skills; and it demonstrates higher effectiveness in practical lessons conducted in small groups (4–5 individuals) (Lu & Yan, 2023, p. 7).

Researcher O. Onopriienko emphasizes that the foundation of project-based learning is the “interaction of subjects, manifested in joint work, cognition, and communication. The student becomes an active participant in project-based learning... The teacher is the student’s partner in this activity, helping to define the goal, revealing the potential of possible forms of work, recommending sources for gathering information, facilitating the forecasting of results, helping to assess the work, and creating conditions for the student’s activity” (Onopriienko, 2013, p. 37).

A summary of the findings indicates that the main focus in project-based learning is shifting from the mere accumulation of knowledge to the development of practical approaches that will help students acquire the skills and abilities necessary to solve real environmental problems. It is widely recognized that only a combination of a theoretical foundation with practical skills can ensure the effective formation of ecological awareness and responsibility in the younger generation.

## 2. Research Methodology

Research questions:

To what extent is the formation of environmental competence in primary school students ensured by the regulatory framework of education in Ukraine?

What are the specifics of organizing environmentally-oriented project-based learning in the integrated course “I Explore the World” in primary school?

Based on pedagogical observation, analysis of student work, and approbation of educational materials, determine how project-based learning influences the formation of environmental competence in primary school students.

### 3. Results

In the regulatory framework of education in Ukraine, particularly in the State Standard of Primary Education (2018), requirements for compulsory learning outcomes are defined in the form of competencies, including environmental competence, which involves “understanding the basics of ecological resource management, adherence to rules of environmental behavior, and prudent use of natural resources”.

They are consistent with the specialized Concept of Environmental Education of Ukraine (2001). The main goal outlined in the document is the formation of an ecological culture of individuals and society as a whole, the development of skills, fundamental ecological knowledge, ecological thinking and consciousness based on the attitude towards nature as a universal and unique value.

In the standard educational program for grades 1–4, the emphasis on ecological literacy is strengthened within the content line “Man and Nature” in the integrated course “I Explore the World”. Students will study the diversity of inanimate and living nature and the work of people in various sectors of the economy using local materials.

Special attention is given to the following outcomes: humane treatment of living beings; the desire to learn about nature; understanding the practical value of nature as a source of human existence; a valuable and responsible attitude towards the surrounding world; and direct participation in environmental protection activities. The ecological orientation involves identifying the connections between inanimate and living nature, the dependence of plant growth and development on light, heat, and moisture; the relationship between animals’ appearance and their habitat, feeding habits, and protection from enemies. The norms of behavior in nature and participation in basic environmental protection activities become

priorities. Special attention is paid to observing the environment during observational trips, local history explorations, and research and educational projects.

The practical field for the implementation of the normative, scientific, and methodological basis was the introduction of the integrated course “I Explore the World” into the educational practice of Ukraine, in which a significant proportion of the content is natural science and ecologically oriented, providing the opportunity to involve students in various projects, particularly environmental protection and local history projects.

Our participation in the development of the content and technological support for the integrated course “I Explore the World” included, among other things, the creation and approbation of projects that involved performing tasks to stimulate interest in learning about natural phenomena, mastering methods of examining objects, analyzing their properties, establishing cause-and-effect relationships between the state of nature and people’s lives and health, and participating in feasible environmental protection activities.

We will provide examples of the use of project-based learning in the educational and methodological kit for the integrated course “I Explore the World”, which has proven its effectiveness in the process of diagnosing results at the end of learning cycles in primary school. It should be noted that the developed materials ensure a gradual increase in the complexity of the project content and a step-by-step introduction of students to the basics of project-based learning, from planning and role distribution to project presentation and design.

In the first grade, this work relied on pictorial instructions, which made the perception of information more visual. For example, in the research project “How I Can Help Planet Earth”, students are offered a list of environmental questions to discuss and supplement with their own ideas, such as: not forgetting to turn off the lights; sorting waste; eating more vegetables and fruits; caring for animals; planting trees together with adults; and using paper on both sides.

As students gain experience in cognitive activities in subsequent grades, they perform more complex tasks that accumulate the acquired knowledge, skills, abilities, and value attitudes obtained in previous stages of learning.

In our research work, a significant role was assigned to projects of a summarizing type, based on students' previous experience, helping them understand their role and responsibility in preserving the environment, and promoting active actions to address environmental problems in their surroundings. Among such tasks, let's mention the project research "How I Influence My Environment", which accumulates knowledge, values, and, most importantly, practical components, which involve the application of knowledge and skills in practice. Each of the thematic sections of this project is structured according to the opportunities for students to environmentally utilize transportation, food, water, energy, clothing, paper, and waste.

As the validation of the developed project shows, the most active students demonstrated themselves during tasks that required assessing their own behavior in various life situations (such as walking or biking; not using public transport or cars; taking a shower daily instead of a bath; always turning off lights when leaving a room; bringing their own eco-bag to the store; recycling old clothing, etc.).

During the summary of collaborative work, students evaluate their actions and draw conclusions. The most indicative among them include: "Now I will personally save electricity and remind others to do so"; "I will turn off the tap when brushing my teeth"; "I will dispose of plastic bottles in a special container"; "I will collect old newspapers, magazines for recycling", and so on.

The project "New Life for Old Things" was of particular interest to students. It proposed to investigate the path that a plastic bottle, a cover of a used notebook, a tin can, or a glass jar would take to be transformed into new things. Students discussed how to reduce the amount of waste, how to give a "second life" to unnecessary items, and how waste sorting affects the environment. At the end of the project, students made a craft from a plastic bottle, an old CD, or a newspaper.

In addition to projects that focus on generalizing and using already acquired skills, the effectiveness of projects based on establishing a connection with the specific living conditions of students has been proven in practice. This role was assigned to the research project "Natural Grouping of My Area", which involved an observational trip to the nearest surroundings

(forest, lake, meadow, etc.). During the project, students found out what plants grow and what animals are found in the environment; how plants and animals have adapted to living conditions; what connections exist in the natural grouping of organisms among themselves and between organisms and inanimate nature; gave examples of food chains that have formed in this natural grouping; identified those that are subject to protection (listed in the Red Book of Ukraine); and determined the human impact on this natural grouping.

In the course of accumulating impressions, students made suggestions for the protection of specific environmental objects. Here are examples of such considerations: fencing off an anthill and making signs with environmental protection content.

The joint creation of the project "Ecological Calendar", as practice shows, ensures an emotional and value-based attitude of students towards the opportunities to join in the celebration of international days for the protection of nature (Earth Day, World Environment Day, etc.); to feel their role and place in maintaining the balance between humans and nature; and to use natural resources sparingly.

According to our observations, participation in the annual environmental event "Earth Hour" motivated students to discuss the possibilities of each individual and everyone together; and encouraged them to search for information about the origins of such an initiative and the results of conducting such an event. The result of the project activity was the placement of an ecological calendar with dates and information about the events for students from other classes to familiarize themselves with.

In addition to carrying out projects based on subject content, the most effective ones are those that create opportunities for the integration of various school subjects and ensure the formation of a holistic vision of environmental problems and ways to solve them. An example of such a project, using the program content of mathematical, technological, natural, health-preserving, and social fields, is the research project "Waste Paper – Not Garbage", which we developed and tested. Students find out what can be recycled as waste paper and how it is sorted; they become acquainted with the technological process of raw material processing in stages; and they calculate how many trees one person can save by collecting waste paper.

As a result of this project, a box container for collecting waste paper was installed on the school premises.

The analysis of the products of students' project-based learning indicates the development of their cognitive independence; the manifestation of environmental awareness; a value-based attitude towards environmental objects; the development of empathy and a sense of personal responsibility for the state of the environment. This is extremely important for the ecological situation that has developed in our country during the aggressive invasion by a neighboring state.

The skills developed during the implementation of educational projects, such as adhering to environmentally appropriate behavior in everyday life, interacting with others during project implementation, and applying the acquired experience in real-life situations, are indicators of students' environmental competence at the primary education stage.

#### 4. Discussion

The primary school age is recognized as a sensitive period for perceiving pedagogical influences and being receptive to acquiring knowledge about oneself and the surrounding world. It is during this age that children are most susceptible to forming a value-based attitude towards the environment (L'Ecuyer et al., 2020).

We agree with the opinion of Eliseo P. Marpa that environmental education is necessary for teaching and learning. Teaching students to act in defense of the environment is considered very important. Its goal is to develop an informed citizen who is environmentally conscious and motivated to actively participate in the management and sustainable use of their environment. This has led to the integration of environmental education into the school curriculum at all levels. The main purpose of this process is to enable school students to develop knowledge about the environment and awareness of environmental issues and problems so that they can actively participate in finding and implementing solutions to the problems they face in the environment (Marpa, 2020, p. 2).

To determine the state of implementation of environmental education for primary school students in modern conditions, as well as teachers' positions re-

garding the regulatory and methodological support for this process, we developed a diagnostic program for primary school teachers. The survey results demonstrated that overall, the level of organization of environmental education for primary school students in Ukrainian schools is assessed as satisfactory: 36 (63.8%) out of 58 respondents gave a positive answer. However, in the opinion of a third of the respondents (22 respondents (36.2%) answered "No"), there are opportunities for improvement through updating the content of academic subjects, introducing additional courses with an environmental focus, and so on. As a methodological tool for realizing the developed resource, teachers recognized the effectiveness of implementing projects, which confirms the conclusions of scholars about their key role in acquiring environmental knowledge and forming a responsible attitude towards nature (Pavlova, 2024, p. 47).

Based on the analysis of the collected data, researchers E. Sukma, S. Ramadhan and V. Indriyani identified topics that are close to the context of primary school students and can be integrated into the learning process: waste management (93%), conservation of marine and river resources (68.8%), use of environmentally friendly products (86.7%), global warming (63.3%), forest conservation (73.4%), animal protection (82%), management of plant waste (58.6%), pollution (75.8%), and energy conservation (85.2%) (Sukma et al., 2020, p. 4). It should be noted that the projects we proposed cover topics such as waste management, the use of environmentally friendly products, pollution issues, and energy conservation.

We share the views of researchers Lu Zhang and Yan Ma that project-based learning in primary school has a significant impact, especially when compared to other educational levels. According to the research results, the effect size at the primary school level is higher than in middle school and higher than the results at the university level. These results underscore that project-based learning can be particularly effective in primary school, helping students better acquire knowledge through active participation in learning projects that integrate real-world problems and require critical thinking and problem-solving (Lu & Ma, 2023, p.7).

The research results of M. Aksela and O. Haatainen demonstrate that project-based learning enhances

students' responsibility, purposefulness, independence, and discipline; promotes social learning and the development of communication, negotiation, and collaboration skills; provides a choice, which is key to student success, as well as supports differentiation, allowing students to develop personal interests and deepen learning. Project-based learning is also noted for its high adaptability to different types of students and learning situations, which fosters deep student engagement in real-world projects and strengthens their knowledge and skills (Aksela & Haatainen, 2019, p. 12–13).

## 5. Conclusions

The peculiarities of organizing environmentally oriented project-based learning in the lessons of the integrated course “I Explore the World” in primary school involve working on projects that correspond to the age characteristics of students. The projects are structured in such a way that they gradually become more complex in content, in accordance with the development of children's cognitive and social skills. This not only contributes to their in-depth understanding of environmental issues but also develops their ability to think critically and solve complex tasks, which is crucial for forming a responsible attitude towards the environment.

The analysis of the conducted research confirms that project-based learning significantly increases the effectiveness of forming ecological competence in younger students, particularly their understanding of the connections between human economic activity and the state of the environment. Through project-based learning, students acquire not only ecological knowledge but also the ability to apply this knowledge in practical situations, which contributes to the formation of a value-based attitude towards nature.

Several issues require further scientific research, including:

- Involving modern educational technologies and digital tools, which can increase student engagement and improve the results of project-based learning.
- Investigating the long-term impact of project-based learning on children's behavior towards nature and environmental protection actions.

- Developing effective methods for assessing environmental competence, which takes into account not only knowledge but also practical skills and personal development.
- Studying and summarizing international practices regarding environmental education for primary school students and wider use of the project method.

## References

- Aksela, M., & Haatainen, O. (2019). *Project-based learning (PBL) in practise: Active teachers' views of its advantages and challenges*. 5th International STEM in Education Conference. [https://www.researchgate.net/publication/333868087\\_PROJECT-BASED\\_LEARNING\\_PBL\\_IN\\_PRACTISE\\_ACTIVE\\_TEACHERS\\_VIEWS\\_OF\\_ITS\\_ADVANTAGES\\_AND\\_CHALLENGES](https://www.researchgate.net/publication/333868087_PROJECT-BASED_LEARNING_PBL_IN_PRACTISE_ACTIVE_TEACHERS_VIEWS_OF_ITS_ADVANTAGES_AND_CHALLENGES).
- L'Ecuyer, C., Bernacer, J., & Guell, F. (2020). Four pillars of the Montessori method and their support by current neuroscience. *Mind, Brain and Education*, 14(4), 322–334. [https://www.researchgate.net/publication/345259218\\_Four\\_Pillars\\_of\\_the\\_Montessori\\_Method\\_and\\_Their\\_Support\\_by\\_Current\\_Neuroscience](https://www.researchgate.net/publication/345259218_Four_Pillars_of_the_Montessori_Method_and_Their_Support_by_Current_Neuroscience).
- Lu, Z., & Ma, Y. (2023). A study of the impact of project-based learning on student learning effects: A meta-analysis study. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1202728>.
- Marpa, E. P. (2020). Navigating environmental education practices to promote environmental awareness and education. *International Journal on Studies in Education*, 2(1). <https://ijonse.net/index.php/ijonse/article/view/8/pdf>.
- Mirzaeva, N. (2019). Theory and practice of ecological competence in students. *Central Asian Journal of Education*, 3(1), 66–97. [https://www.researchgate.net/publication/344879259\\_THEORY\\_AND\\_PRACTICE\\_OF\\_ECOLOGICAL\\_COMPETENCE\\_IN\\_STUDENTS](https://www.researchgate.net/publication/344879259_THEORY_AND_PRACTICE_OF_ECOLOGICAL_COMPETENCE_IN_STUDENTS).
- Onopriienko, O. (2013). *Proektna diialnist u pochatkovii shkoli: Metodychnyi posibnyk*. TOV “SITIPRINT”.
- Pavlova, T. (2024). Formuvannia ekolohichnoi kompetentnosti molodshykh shkolariv: diialnisnyi pidkhid. *Acta Paedagogica Volynienses*, 1, 42–51. <https://doi.org/10.32782/apv/2024.1.7>.
- Piscová, V., Lehotayová, J., & Hreško, J. (2023). Environmental education in the school system at elementary schools in Slovakia. *European Journal of Science and Mathematics Education*, 11(4), 650–671. <https://doi.org/10.30935/scimath/13377>.
- Sukma, E., Ramadhan, S., & Indriyani, V. (2020). Integration of environmental education in elementary

- schools. *Journal of Physics: Conference Series*, 1481(1), 012136. <https://doi.org/10.1088/1742-6596/1481/1/012136>.
- The Environmental Performance Index. (2022). <https://epi.yale.edu/epi-results/2022/component/epi>.
- Uddin, M. R., Shimizu, K., & Widiyatmoko, A. (2020). Assessing secondary level students' critical thinking skills: inspiring environmental education for achieving sustainable development goals. *Journal of Physics: Conference Series*, 1567(2), 022043. <https://doi.org/10.1088/1742-6596/1567/2/022043>.
- UNESCO-UNEP. (1994). <https://unesdoc.unesco.org/ark:/48223/pf0000153531>.
- United Nations Conference on Environment & Development. (1992). *Agenda 21*. <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>.
- United Nations Educational, Scientific and Cultural Organization. (2021). *Learn for our planet: A global review of how environmental issues are integrated in education*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000377362>.